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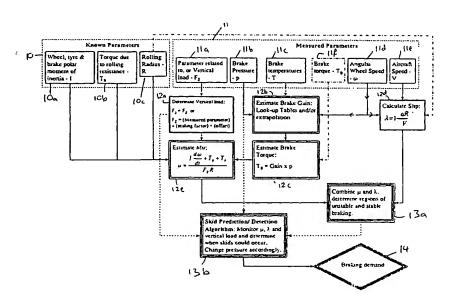
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[Continued on next page]

(54) Title: AIRCRAFT BRAKING METHOD AND APPARATUS



(57) Abstract: An aircraft is decelerated by applying a braking force to a wheel of the aircraft as it moves along the ground. An anti skid controller calculates the braking force to be applied by taking into account data (boxes 11a, 12a) relating to the vertical load transmitted between the ground and the wheel and data (boxes 11d, 11e and 12d) relating to the slip between the ground and the wheel. Predictions (box 13b) made regarding how the vertical load will change and data (box 13a) concerning the relationship between slip and the ground to wheel friction coefficient are both taken into account when calculating (boxes 13b, 14) the braking force to be applied. Skids may thereby be predicted in advance and may be reduced or even avoided.

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INTERNATIONAL SEARCH REPORT

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| EPO-In | | ise and, where provided a | earch lethis noted | | |
| C. DOCUME | ENTS CONSIDERED TO BE RELEVANT | | | | |
| Category * | Citation of document, with indication, where appropriate, of the rel | levant passages | | Relevant to claim No. | |
| X | GB 1 018 548 A (NORTH AMERICAN AVINC) 26 January 1966 (1966-01-26) page 4, line 29 -page 5, line 81 page 8, line 1 -page 9, line 21; |) | | 1-17 | |
| X | US 4 958 512 A (JOHNSEN ODDVARD) 25 September 1990 (1990-09-25) column 3, line 22 -column 4, line column 5, line 36 -column 6, line | e 53 e 39 | | 1-17 | |
| X | GB 1 077 636 A (MATERIELS HISPAND D E) 2 August 1967 (1967-08-02) page 2, line 38 -page 3, line 125 | | | 1–17 | |
| x | US 5 167 385 A (HAEFNER HANS W) 1 December 1992 (1992-12-01) | | | 1,2, 5-10,12, 15-17 | |
| | column 5, line 19 -column 6, line | 25 | | 15-1/ | |
| _ 1 | - | -/- - | | | |
| X Furth | er documents are listed in the continuation of box C. | χ Patent family me | embers are listed i | in annex. | |
| ° Special cat | egories of cited documents : | *T* later decument public | ted effective into | | |
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| other means ments, such combination being obvious to a person skilled 'P' document published prior to the international filing date but in the art. | | | | | |
| | an the priority date claimed ctual completion of the international search | *&* document member of Date of mailing of the | | | |
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| Name and m | aling address of the ISA European Patent Office, P.B. 5816 Patentlaan 2 | Authorized officer | | | |
| | NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016 | Marx, W | | | |

INTERNATIONAL SEARCH REPORT

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|---|-------|------------------|
| | PCT. | 03/02506 |

| | | PC1) 03/02506 |
|------------|--|-----------------------|
| | etion) DOCUMENTS CONSIDERED TO BE RELEVANT | |
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | US 4 613 190 A (JOHNSON STUART E) 23 September 1986 (1986-09-23) column 6, line 9 -column 7, line 29 | 1-4, 11-14 |
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INTERNATIONAL SEARCH REPORT

on on patent family members

| Inte | Application No |
|------|----------------|
| PCT | 03/02506 |

| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
|--|---|---------------------|------|-------------------------|------------------|
| GB 1018548 | Α | 26-01-1966 | NONE | | |
| US 4958512 | А | 25-09-1990 | NO | 881513 A | 09-10-1989 |
| | | | AT | 116610 T | 15-01-1995 |
| | | | DE | 68920431 D1 | 16-02-1995 |
| | | | DE | 68920431 T2 | 06-07-1995 |
| | | | EP | 0414715 A1 | 06-03-1991 |
| | | | GB | 2217025 A ,B | 18-10-1989 |
| | | | HK | 1007541 A1 | 16-04-1999 |
| | | | JP | 2933660 B2 | 16-08-1999 |
| | | | JP | 3504706 T | 17-10-1991 |
| | | | NO | 890663 A ,B, | 09-10-1989 |
| | | | WO | 8909710 A1 | 19-10-1989 |
| | | | SE | 501182 C2 | 05-12-1994 |
| | | | SE | 8801574 A | 08-10-1989 |
| | | | US | 5195808 A | 23-03-1993 |
| | | | US | 5249851 A | 05-10-1993 |
| GB 1077636 | Α | 02-08-1967 | FR | 1378958 A | 20-11-1964 |
| | | | FR | 1407168 A | 30-07-1965 |
| | | | GB | 1077637 A | 02-08-1967 |
| | | | JP | 51040211 B | 02-11-1976 |
| | | | DE | 1271559 B | 27-06-1968 |
| | | | US | 3362757 A | 09-01-1968 |
| US 5167385 | A | 01-12-1992 | DE | 3803015 A1 | 10-08-1989 |
| | | | FR | 2626688 A1 | 04-08-1989 |
| US 4613190 | A | 23-09-1986 | NONE | | |